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AN

ACCOUNT

OF

Some Neutral Salts made with vegetable Acids, and with the Salt of Amber.

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Some Neutral Salts made with Vegetable Acids, and with the Salt of Amber.

THOUGH no substances have been more generally used, both for the preservation of health, and the cure of diseases, than vegetable acids, yet hitherto they have been examined with so little care, that it has been the common received opinion, that they were all nearly of the same nature, at least as to their chemical properties, and possessed nearly of the same virtues; but the following account of neutral salts, made with these acids, and the fossil or mineral alkali, shews that they differ materially from one another.

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Previous,

Previous, however, to entering into the account of theſe ſalts, it will be proper to mention ſome few things relative to ſalts in general.

Simple ſalts are commonly divided into *acid* and *alkaline*.

The *acid* are reckoned four in number.

1. The vitriolic.
2. The nitrous.
3. The marine, or muriatic.
4. And the vegetable.

The *alkaline* three.

1. The vegetable, or that which is got from the aſhes of moſt vegetable ſubſtances.

2. The foſſil, or mineral, called likewiſe ſoda and natrum, which is got either by burning certain marine plants; or from ſea ſalt; or in the bowels of the earth.

3. The volatile, which is got either by putrefaction, or by the force of fire, from moſt animal ſubſtances; or by diſtillation from muſtard ſeed, and ſome other particular vegetables.

The *acid* are diſtinguiſhed from each other, by their taſte, ſmell, and other properties, but principally by their forming different neutral ſalts with the ſame alkali.

And the *alkaline* are known likewiſe from one another, by their forming different neutral ſalts, when joined with the ſame acid.

Hence when we find *acid*, or *alkaline* ſalts, in different bodies, if we ſaturate each with the ſame alkali, or with

with the ſame acid, according as the original ſalt is of an acid, or of an alkaline nature, and find upon diſſolving, evaporating, and cryſtalliſing the neutral ſalts, that they are all of the ſame kind, we conclude, that the original acid, or alkali, was the ſame in all; but if we obtain different neutral ſalts from each, we conclude that the original acid, or alkali, was different in each.

If there are no more alkaline ſalts in nature, than the three already mentioned; and if there were no more acids than four; then the number of neutral ſalts would be confined to the twelve marked in Dr. Cullen's Table; but it will appear from the following experiments, that inſtead of one, there are many vegetable acids; and that, therefore, the number of true neutral ſalts muſt be greatly multiplied *.

* Dr. Cullen's Table of neutral Salts.

Acid	Alkaline	Neutral Salt	Acid	Alkaline	Neutral Salt
Vitriolic	Vegetable	Vitriolic Tartar	Marine or Muriatic	Vegetable	Sal. digeſt. Sylvii
	Foſſil	Glauber Salt		Foſſil	Common Salt
	Volatile	Vitriol. Ammoniac		Volatile	Common Ammoniac
Nitrous	Vegetable	Common Nitre	Vegetable	Vegetable	Regenerated Tartar
	Foſſil	Cubic Nitre		Foſſil	Rochelle Salt
	Volatile	Nitrous Ammoniac		Volatile	Spiritus Mindereri

Dr. Vogel, Profeſſor of chemiſtry in the univerſity of Gottengen, in his Inſtitutiones Chemiæ, publiſhed in 1752, gives a table of neutral ſalts, which comprehends the twelve mentioned by Dr. Cullen, with the addition of three or four more. He ſeems to believe, that the acid of vitriol forms a different neutral ſalt with the pot-aſh, and with the alkali procured from nitre. He mentions three ſalts, made with the vegetable alkali

Many chemiſts have affirmed, that the vitriolic is the only original acid in nature; and that the nitrous and marine are only this acid changed into different forms by foreign mixtures; and Dr. Boerhaave *, Vogel †, Macquer ‡, and moſt late chemiſts, ſeem to think, that as all trees, plants, and other vegetable ſubſtances, receive their nouriſhment from the bowels of the earth, therefore their acids are only ſome of the mineral changed into a different form by the vegetative proceſs; and that they all approached in their nature either to the vitriolic, the nitrous, or the marine: and as the neutral ſalts, produced from the mixture of the vegetable alkali, with vinegar, cream of tartar, and other common vegetable acids, have a good deal of the ſame external appearance, moſt chemiſts have concluded, that all vegetable acids were nearly of the ſame nature; though ſome few have ſuſpected, that they might be found to differ from one another, and to have different degrees of affinity, if they were examined with care; and to confirm this, Dr. Vogel § tells us, that if ſome of the Rochelle ſalts be thrown into a decoction of tamarinds, the alkaline baſis of the Rochelle ſalt will unite with the acid of the tamarinds, and the cream of tartar will be precipitated.

and vegetable acids; to wit, with vinegar, cryſtals of tartar, and lemon; and one with the native acid ſalt (as he calls it) of urine, and the volatile alkali, and one with the acid of tartar, and the volatile alkali.

* Boerhavii Element. Chemiæ, vol. I. 804.

† Vogel, Inſtitut. Chemiæ, p. 215. ſect. 468. Ed. II.

‡ Macquer, Elemens de Chymie Theorique, chap. xvi. p. 240.

§ Vogel, Inſtitut. Chemiæ, p. 216. ſect. 469.

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As I always ſuſpected, from the taſte and ſmell, that vegetable acids differed materially from one another, and was the more confirmed in this opinion by the above experiment mentioned by Dr. Vogel, I began to conſider whether ſome method might not be fallen upon to determine this queſtion; and, on recollecting, that the Rochelle ſalt * concreted into large ſolid cryſtals, which preſerved their figure long, even in ~~the~~ an open ~~air~~ Veſsel though the tartarus tartariſatus † always appeared in the form of a powdery foliated ſalt, and run very ſoon *per deliquium*, when expoſed to the air, I imagined, that if we were to unite the foſſil, or mineral alkali, with different vegetable acids, we ſhould be able to obtain true neutral ſalts in form of regular cryſtals; which would ſhew how far theſe acids differed or approached to each other in their nature and properties; and, upon trial, found that I had judged right; for each particular acid almoſt yielded a neutral ſalt peculiar to itſelf, of which I ſhall now give a particular account, and ſhall range theſe ſalts under the following heads.

1. Of neutral ſalts formed with native vegetable acids.

2. Of neutral ſalts formed with fermented vegetable acids.

* The Rochelle ſalt is made with the cryſtals of tartar, and the foſſil alkali.

† The tartarus tartariſatus, with the cryſtals of tartar, and the ſalt of tartar; ſo that the only difference between theſe two ſalts is, that the one is made with the foſſil, and the other with the vegetable alkali.

3. Of neutral ſalts formed with diſtilled vegetable acids.

4. Of neutral ſalts formed with flowers of benzoin and ſalt of amber.

SECT. I.

Of neutral ſalts formed with native vegetable acids, and the foſſil or mineral alkali.

EXPERIMENT I.

With the acid of lemons.

The firſt experiment I made was with the acid of lemons; ſix ounces of the juice ſaturated rather more than three drams of the foſſil alkali; and upon evaporating the liquor to a pellicle, and letting it ſtand for ſome days, I obtained a ſalt compoſed of a number of ſmall cryſtals of irregular figures; ſome appeared to be irregular ſquares, or rhomboidal; others irregular pentagons; others to have more ſides; but this general appearance was nearly what is repreſented at *a. a. a.* &c. in TAB. I. fig. 1. They were moſtly flat, and not above $\frac{1}{8}$ or $\frac{1}{10}$ of an inch thick; though ſome few were ſomewhat of an oblong irregular cubical ſhape, if I may be allowed to uſe the expreſſion.

Having obſerved that the figure of neutral ſalts, made with vegetable acids, varied ſometimes, according as they were cryſtalliſed in larger or leſs quantity, I got a quart of lemon juice, and ſaturated it with about two ounces, and two drams of the foſſil

foſſil alkali. Before adding the alkaline ſalt in this experiment, I tried the temperature of the lemon juice with one of Fahrenheit's thermometers, and found that the quickſilver ſtood in the tube at 54; upon removing the thermometer, I immediately added the alkaline ſalt; and as the ſolution was begun, I again put the thermometer into the liquor, and let it remain for above a minute, and the quickſilver ſunk above one degree; ſo that this acid generates cold in the time of its uniting with the foſſil alkali, though the neutral ſalt, produced from their union, does not affect the thermometer in the time of its ſolution in water.

The appearance of the ſalt obtained in this cryſtalliſation was very different from what it was in the former. The whole was made up of an infinite number of cryſtals, ſo ſmall that one at firſt could ſcarce diſtinguiſh their figure; but on examination part ſeemed to be of the ſame ſhape as the larger ones, got in the former proceſs; the others were very ſmall oblong parallelograms, and they were every where interſperſed with a number of ſmall longiſh cryſtals, which in many places lay acroſs each other, and formed a kind of lattice work. The general appearance of this cryſtalliſation is repreſented by *b. b.* &c. in Tab. I. fig. 1. and that of ſome of the particular cryſtals by *c. c. c.*

The taſte of this ſalt is very mild, and rather pleaſant, approaching a little to that of a very weak ſea ſalt.

EXPE-

Experiment II.

With the acid of limes.

The lime is a fruit of the ſame genus as the lemon; its acid is ſharper, and has a more agreeable flavour. From the near reſemblance of theſe two fruits, one ſhould have ſuſpected that the neutral ſalt of both would have been almoſt the ſame; but their appearance is ſomewhat different, though perhaps upon more accurate trials they may be found to have nearly the ſame virtues, and chemical properties.

The firſt experiment I made was with the juice of a dozen and a half of ſmall limes; and the neutral ſalt, produced from thence, was of the ſame ſhape, figure, and appearance, as the larger cryſtals obtained in the firſt experiment with the lemons; only the cryſtals were much ſmaller, and ſuch as repreſented by *a. a.* &c. fig. 2. But having afterwards procured three dozen of larger and finer limes, I got from them near three times the quantity of juice I had in the former proceſs; and having ſaturated this with the alkali, evaporated and cryſtalliſed it, I obtained a ſalt very different in its appearance from the former; though, in other reſpects, it ſeemed to be intirely of the ſame nature. Its cryſtals were of the ſize, and ſomewhat of the appearance, of barley corns, or grains of wheat, as at *c. c. c.*; ſome larger, ſome ſmaller; and laid in an irregular manner, but ſo as to form a beautiful cryſtalliſation, which is repreſented by *b. b. b.* fig. 2. They appeared,

peared, at a little diſtance, to be roundiſh, but on examining narrowly, their ſides were found to be made up of five or ſix flat ſurfaces; and generally one end of each cryſtal was made up of two flattiſh ſides, which roſe like a wedge which did not come quite to a point, but left a ſmall narrow ſurface between.

Theſe chryſtals, in the mouth, impreſs at firſt a very ſlight ſaltiſh, and ſomewhat ſweetiſh cool taſte; which is by no means unpleaſant, and reſembles a good deal that of the ſalt of lemons. They did not affect the thermometer in the time of their ſolution in water.

Experiments III. and IV.

With the acid of Sevill oranges, and of peaches.

It being late in the ſummer before I made any experiment with the juice of the Sevill oranges, I could get none of this fruit but what had been long kept and was ſhrivelled, in ſo much that a dozen and a half of the oranges did not yield more than half a pint of juice, which had loſt a great deal of its acidity, and ſaturated but a very ſmall quantity of the alkali; and on cryſtalliſing I could obtain no other ſalt but a few very ſmall cubical or ſquare cryſtals, ſuch as are repreſented by fig. 3. and ſimilar to the ſalt got in an experiment I made with peaches, as may be ſeen in fig. 4. A ſaponaceous or mucous matter, with which theſe ſaturated juices abounded, ſeemed to prevent the cryſtalliſation of the ſalts.

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As both the juice of the orange, and of the peaches, was in ſmall quantity, and not in the moſt proper ſtate for yielding a neutral ſalt, theſe experiments ought to be repeated, before we can ſay what is the natural figure and appearance of the ſalts, that may be got by ſaturating the juices of theſe fruits with an alkali.

Experiment V.

With the acid of currants.

A quart of the juice of white currants, after being ſaturated with about nine drams of the foſſil alkali, and purified by repeated filtrations, was evaporated till a pellicle appeared; being put into a cool place, and allowed to ſtand for two or three days, it yielded a number of ſmall ſquare flattiſh cryſtals, ſuch as are repreſented by fig. 5. Many of them ſeemed to be exact ſquares, and in general they approached nearer to this figure, than the cryſtals of any of the other neutral ſalts I have hitherto met with.

This ſalt approached in its taſte to that of the limes; its cryſtals were hard and firm, and did not run *per deliquium*.

Experiment VI.

With the acid of gooſeberries.

A quart of the juice of gooſeberries, being treated in the ſame way, as that of the currants, yielded a neutral

neutral ſalt very different in its appearance, from any of thoſe hitherto mentioned. Its baſis, or what adhered to the tea-cup, was made up of a number of very ſmall roundiſh or ſquariſh cryſtals; which formed an incruſtation thicker than a ſhilling; from which grew up a number of very fine, thin, tranſparent plates, of irregular ſhapes; they were narrower at the baſis than above; and in ſome meaſure might be compared to the ſcales of a ſmall fiſh, or the wings of flies, ſet on their edges at a little diſtance from one another; in ſome places the plates aroſe from the ſides of others; and in others they appeared ſomewhat like the fine leaves of very ſmall plants. In fig. 6. we have different views of this ſalt; *a. a.* repreſents a piece of cryſtalliſed ſalt viewed from above; *b. b.* a profile view of the thin plates ſtanding on their baſis; *c. c.* the baſis itſelf; and the letters *d.* a view of the thin plates laid on their flat ſides.

Experiment VII.

With the acid of apples.

Having got two dozen of codling apples, I cut them to pieces, put them into a large earthen veſſel, and poured three quarts of water upon them; and then diſſolved above two ounces of the foſſil alkaline ſalt in the water, and let them ſtand for ſix days; on examining, I found the water to be nearly in a neutral ſtate; it did not ferment on the addition either of an acid or of an alkali. I then filtered the liquor through paper, and evaporated it,

till it was reduced to about five or ſix ounces, when it became thick, and a pellicle began to form on the ſurface. I then ſet it in a cool place, to allow the ſalts to concrete. After two days were elapſed, it was covered with a blueiſh variegated ſaline cruſt; immediately below which was a clay coloured ſaline matter, which reſembled wet earth or ſand, that had been raiſed by ſmall worms; and this was interſperſed every where with ſmall flattiſh globules of the ſame ſort of matter; below this was a purpliſh jelly, interſperſed with a whitiſh or aſh coloured ſaline matter, formed into irregular longiſh flat plates, which looked more like a compoſition of ſalt and earth than a pure ſalt. The appearance of this ſaline matter made me ſuſpect, that it was mixed with ſome ſort of oil, which the alkaline ſalt had extracted from the ſkins of the apples, which I had forgot to peel off before infuſing them in water; I therefore got a freſh parcel of codling apples, which I cauſed to be carefully peeled, and then treated them in the ſame manner as the former, and obtained the beautiful ſalt painted in fig. 7. which reſembled a good deal the ſalt of the gooſeberries; being compoſed of a number of ſmall roundiſh very delicate tranſparent plates, ſtanding on one edge, on a fine ſaline cruſt, which adhered every where to the ſides of the china baſon; and were inteſperſed with a grey coloured ſaline matter. The cryſtals of this ſalt were in general rather ſmaller, rounder, and more of a ſize, than thoſe of the gooſeberry; and I did not obſerve any riſing from the ſides of others as in it; and they ſeemed to be diſpoſed in a more regular uniform manner.

The

The letters *a. a.* &c. repreſent pieces of this cryſtalliſation viewed from above; *b. b.* &c. ſome of the fine plates laid on their ſide; *c. c.* and *e* ſome of the aſh coloured plates obtained in the firſt operation; *d. d.* ſome of the brown clay coloured ſaline matter; *f.* the flattiſh globules, which beſet every where the inſide of the pellicle, that was on the top.

After the cryſtalliſation of the ſalt in this ſecond proceſs, the liquor which remained was poured into another ſmall china baſon; and, on being evaporated, exhibited nearly the ſame appearances as had been obſerved in the firſt proceſs.

Experiment VIII.

With the acid of wild ſorrel.

In order to ſave the trouble of a tedious evaporation, by ſaturating this acid mixed with the other juices of the plant, I procured ſome of the eſſential ſalt of the wild ſorrel, from Mr. Heineken, apothecary in Duke-ſtreet; which I diſſolved in boiling water, and ſaturated with the alkali; and by evaporating obtained a beautiful pure white neutral ſalt, which is repreſented by fig. 8; *a. a.* ſhews a part of the cryſtalliſation where the ſalt ſhot into longiſh cryſtals, reſembling ſomewhat the ſmall ones of nitre; none of them exceeded the length of half an inch; *b. b.* other pieces of the cryſtalliſation, which had a different appearance; *c. c.* a piece where it appeared like a ſmall granulated ſalt; *d. d.* ſome ſmall roundiſh or ſquare cryſtals, which adhered like

a cruſt to the ſides of the tea-cup; *e. e. e.* detached cryſtals.

Experiment IX.

With the acid of tamarinds.

Having had a preſent of ſome tamarinds in pods, from Mr. Arch. Gloſter, practitioner in phyſick in Antigua, I took out the pulp, and put about two pound of it into three quarts of water; and then ſaturated its acid with the alkali, and, after filtrating the liquor, I evaporated it to the conſiſtence of a ſyrup, and then put it into a cool place for 24 hours; when I found that a cryſtalliſation had actually taken place, I ſeparated the ſalt from a thick ſweetiſh liquor of the conſiſtence of a ſyrup; after it was dried, it had the appearance of a piece of common moſs, made up of a number of ſmall cryſtals diſpoſed in an irregular manner, and mixed with viſcid or ſaccharine juices. The letters *a. a.* &c. of fig. 9. ſhew ſome pieces of this ſalt while it remained in this form.

As I ſuſpected this ſalt to be ſtill mixed with a viſcid matter, I diſſolved ſome of it in warm water, and cryſtalliſed it anew, when it had a very different appearance, for it had ſhot into an infinite number of very ſmall cryſtals, which came every where from centres. The length of theſe cryſtals did not exceed half an inch at moſt; they were no thicker than horſehairs, or common white thread. How many cryſtals ſhot from each centre I could not determine; but, in many places, the cryſtalliſation

ſation roſe into ſmall oblong, oval, or roundiſh tufts, made up of an infinite number of the ſmall cryſtals that ſhot from the centre towards the circumference.

Some of the concentrated liquor having been accidentally left in a ſaucer, and on the ſides of a tea cup at night, next morning the liquor in both veſſels had ſhot every where into ſmall fine cryſtals, that came like radii from a centre; in ſome places they had compleated the circle, in others only half, and in others only the two oppoſite quarters.

I treated three pound of Eaſt-India tamarinds, which I bought in a ſhop in Caſtle-Street, in the ſame manner; only, after they were ſaturated with the alkali, and the liquor filtrated, it was ſet by for ſome weeks, and then filtered again before it was evaporated. The people of whom I bought theſe tamarinds told me, that there was no ſugar mixed with them; and I believe what they ſaid was true, for I obtained eaſily a very pure and fine ſalt from them. Having at firſt carried the evaporation too far, as ſoon as the liquor was removed from the fire, it immediately began to concrete in form of a number of ſmall circles on the ſurface of the liquor, which were ſucceſſively ſucceeded by others, till the whole became one ſolid maſs; but on diſſolving this maſs in water, and evaporating only a little, and ſetting the liquor in a cool place to allow the ſalts to concrete, the cryſtalliſation began on the ſurface of the liquor, in form of ſmall circles or ſtars, and I obtained a ſalt in every reſpect ſimilar to the former.

The general appearance of this ſalt is repreſented by *b*, *b*, in fig. 9, and the different appearances in different parts of the cryſtalliſation by *c*, *c*.

Expe-

EXPERIMENT X.

With the acid of plums.

Having got a quantity of the larger ſort of the green plums, I cauſed the ſtones to be picked out, and the plums to be bruiſed and put into a large china bowl; I then poured about two quarts of water over them, and ſaturated their acid with the foſſil alkali; after they had ſtood 24 hours, I ſtrained off the liquor, filtered, and evaporated it, till there remained only a few ounces, when it was ſet in a cool place for four days, at the end of which time I found that a cryſtalliſation had taken place; but, upon pouring off the ſuperfluous liquor, I could not obſerve any general form of cryſtalliſation; the whole was made up of a number of very thin, flat, longiſh cryſtals, from about $\frac{1}{12}$ to $\frac{3}{4}$ of an inch long, and from $\frac{1}{12}$ to $\frac{1}{6}$ or $\frac{1}{5}$ of an inch broad, of an irregular figure, laid without any particular form, and mixed every where with a mucous and black oily matter; when dry, the whole appeared like a confuſed maſs, where however the form of ſome of the cryſtals was to be obſerved, as is to be ſeen at *a*, *a*, in fig. 10; in ſome places the cryſtals ſeemed to be laid with their edges uppermoſt, and in others in a different manner, as at *b*, *b*, &c.

In order to know the regular and true form of the cryſtalliſation of this ſalt, I ſeparated a quantity of the pureſt from the large maſs, diſſolved it in boiling water, filtered it through paper, and cryſtalliſed it a ſecond time in a tea cup. It now appeared in a more regular form; the cryſtalliſa-
tion

tion was divided into four roundiſh clumps, or cluſters, which were ſeparated or diſtinguiſhed from each other by a furrow. Each clump was made up of a number of very fine delicate plates laid edgeways, in ſomewhat of a regular manner; and between them a number of others, where part of the flat ſides were to be ſeen, and amongſt them an infinite number of ſmall rhomboidal or roundiſh cryſtals; the clumps appeared, in miniature, in the ſun, ſomewhat like to the lower part of the ſpread tail of a peacock. The letters *c, c, c, c,* ſhew the general form of the cryſtalliſation, *d, d, d,* the form and ſhape of ſome of the ſeparate cryſtals.

I treated another parcel of plums of the ſame kind in a different manner; I ſaturated part of the liquor when freſh, and let it ſtand till a fermentation had taken place before I evaporated it; and I let the other half ſtand till the fermentation was over before ſaturating it; but the ſalt obtained from both, appeared nearly in the ſame form, though the number of clumps in this ſecond cryſtalliſation was only three: and in a third experiment the appearances were exactly ſimilar, only the ſalt did not divide into clumps.

This ſalt taſtes cooliſh on the tongue, but does not affect the thermometer, in the time of its ſolution in water.

In the preſent hard froſt * ſome of the ſalt of plums, which had been diſſolved in three or four times its own weight of water, and ſet by in a cloſet, cryſtalliſed anew. The cryſtals were flat, thicker than a ſhilling, and moſt of them had ſix ſides of unequal

* N. B. The account of this laſt part of the experiment was given in to the Royal Society in the beginning of January 1768.

lengths,

lengths, as repreſented by *b*, *b*, in the figure marked large cryſtals of neutral ſalt of plums: where they were run together, their figures were moſt irregular as at *i*, *i*; ſome few ſmall ones were ſquares, as at *k*, *k*. Hence we ſee what a variety the different methods of cryſtalliſation make in the figures of theſe ſalts.

Experiment XI.

With the acid of mulberries.

Three quarts of the pure juice of the mulberry being ſaturated with four ounces of the foſſil alkali, filtered, clarified with the whites of eggs and evaporated, yielded a ſaline matter, mixed with a quantity of a mucus and oil; which, on being purified as much as poſſible, by lying on a ſpongy brown paper, exhibited a very fine granulated ſalt almoſt like ſea ſand, in which no regular-formed cryſtals were to be obſerved.

Some of this ſalt being again diſſolved in water, evaporated and cryſtalliſed a ſecond time, appeared in the tea cup like a cake made up of the ſame ſort of fine granulated ſalt as repreſented at *a*, *a*, fig. 11;—and another parcel *b*, *b*, which was treated in the ſame manner, though it at firſt appeared rougher, and more of a cryſtalline form, yet on examination was found to be made up of the ſame ſort of ſaline matter.—On taking out the cake, there were a few thin very ſmall ſquare cryſtals, ſuch as thoſe marked *c*, *c*, *c*, adhering to the bottom of the tea cup.

A ſmall quantity of the ſaturated juice of the mulberries having been left by accident for ten or twelve

twelve days in different tea cups and china baſons, there formed in each a number of figures, or ſort of cryſtals, reſembling ſomewhat the alphabet of the Chineſe language, interſperſed with a few ſmall, oblong, parallelogram-ſhaped cryſtals, as at *d, d, d.*

Three quarts more being ſaturated with the alkali, were allowed to ſtand for five or ſix weeks, and then filtered and evaporated to about ſeven or eight ounces; the greater part of which was put into a ſtone baſon, and about half an ounce into a ſmall china bowl; after ten days, the liquor in the bowl had ſhot into a number of ſmall thin cryſtals, ſuch as repreſented at *e, e, e;*—and that in the ſtone baſon into a fine pure ſalt made up of ſimilar cryſtals, but thicker and larger, ſuch as thoſe at *f, f, f.*—Theſe laſt are certainly the true [redacted] cryſtals of this ſalt.

Experiment XII.

With the acid of grapes.

A baſket of grapes, which were brought to market for ripe, though many of them were ſtill hard and ſour, and not come to their full perfection, yielded three quarts of juice, which I filtered and ſaturated with two ounces and a dram of the foſſil alkali:—after it had ſtood for a month to depurate, it was again filtered, and then clarified with the whites of eggs, and evaporated to about five ounces, when it became of the conſiſtence of a ſyrup, and had ſomewhat of a ſweetiſh taſte.

It was then ſet in a cool place for two days to cryſtalliſe; but, inſtead of forming any regular cryſtals, it concreted in form of a ſaline matter,

resembling coarse loaf sugar, when it first concretes in a thick syrup; some of which being dried on brown spongy paper, became very white, and seemed to be made up of long, very small crystals, no thicker than hum n hairs, and a saccharine matter.

From this appearance, I judged that the salt was still mixed with a quantity of viscid juices; and therefore I diluted the whole with a quart of New River water, depurated it again with the whites of eggs, and evaporated it to four ounces, which I set in a cool place for eight days; and then, on examining, I found that a crystallisation had taken place, and I obtained above a dram of a pure neutral salt, made up of small, square, and cubic, and small narrow oblong parallelogram crystals, resembling somewhat in appearance those got from the juice of the mulberry, only the crystals were less, as may be seen in fig. 12.

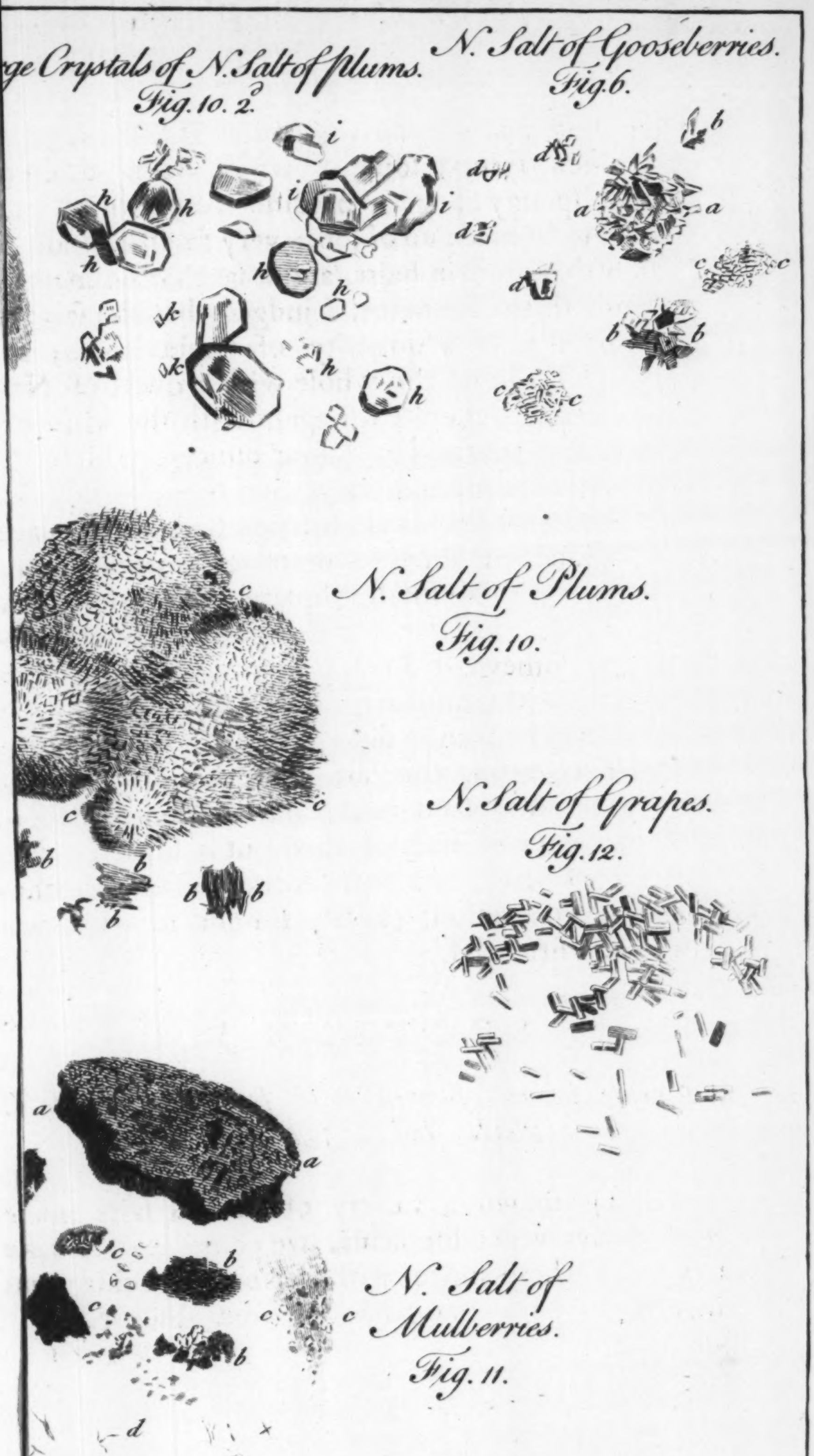
After separating this salt, I set the remaining liquor again in a sand heat, and evaporated about half an ounce of it, and then put it for some days into a cool place; and there formed a saline saccharine-like concretion, exactly similar to what was got in the first trial.

SECTION II.

Of neutral Salts formed with fermented vegetable Acids, and the fossil Alkali.

Having shewn a variety of neutral salts made with native vegetable acids, we come next to take a view of those made with fermented acids, and shall begin with that produced from vinegar.

EXPE-



J. Mynde sculp.

resembling coarse loaf sugar, when it first concretes in a thick syrup; some of which being dried on brown spongy paper, became very white, and seemed to be made up of long, very small crystals, no thicker than human hairs, and a saccharine matter.

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SECTION II.

Of neutral Salts formed with fermented vegetable Acids, and the fossil Alkali.

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EXPE-

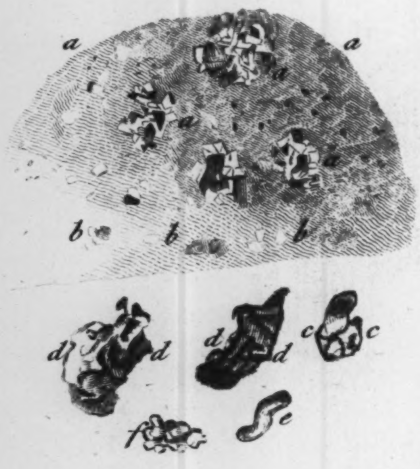
N. Salt of Lemons.
Fig. 1.

N. Salt of Limes.
Fig. 2.

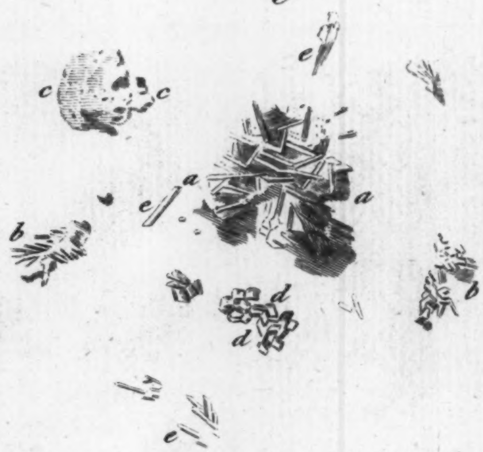
N. Salt of Sevil Orang
Fig. 3.

N. Salt of C
Fig. 5

N. Salt of Apples.
Fig. 7.



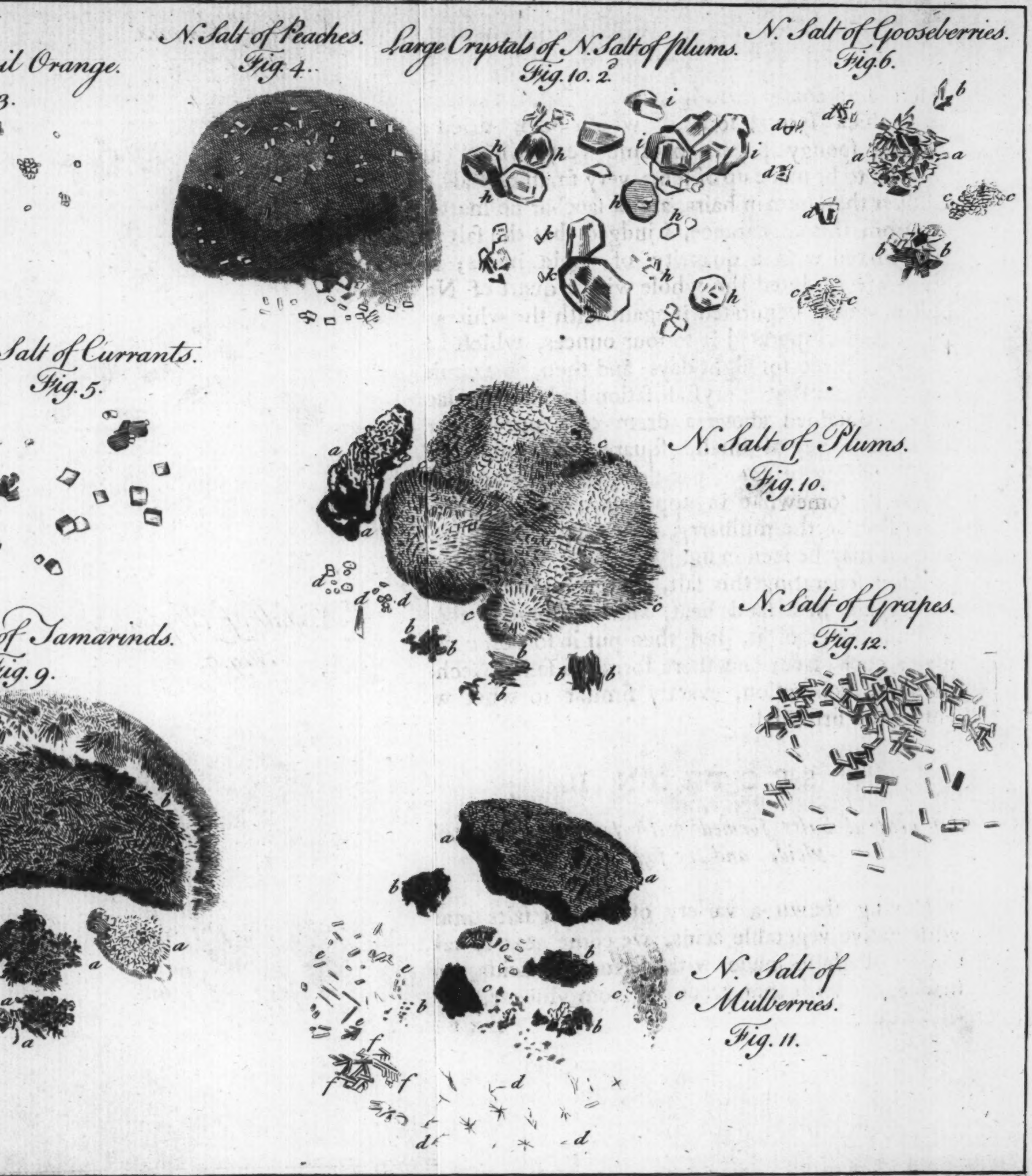
N. Salt of Wild Sorrel.
Fig. 8.



N. Salt of Tam
Fig. 9.

Philos. Trans. Vol. LVII. TAB. XXIII. p. 498.

L. Paul delin.



J. Mynde sculp.

EXPERIMENT ... ...

With common wine and distilled vinegar.

The plain vinegar used, was said to be the [illegible]
white wine vinegar that could be [illegible]
tilled was said to be prepared [illegible]
likewise.

EXPERIMENTS I. and II.

With common wine and diſtilled vinegar*.

The plain vinegar uſed, was ſaid to be the beſt white wine vinegar that could be got; and the diſtilled was ſaid to be prepared from wine vinegar likewiſe.

I ſaturated a pint of each of theſe vinegars, with the pure alkali, evaporated them to a pellicle, and let them ſtand to cryſtalliſe.

From the diſtilled vinegar I obtained the ſalt repreſented by *a*, *a*, *a*, fig. 14, Plate II. which in the evaporating glaſs appeared as you ſee it, reſembling the figure of a ſun in a fire-work. Its cryſtals were a little twiſted; and upon taking them out, and examining them ſeparately, they appeared like ſo many ſmall cryſtals of glauber ſalt, as are repreſented by *b*, *b*, *b*.—On laying the evaporating glaſs on one ſide to allow the liquor to drain away, ſome thin flat ſquare cryſtals, ſuch as are repreſented by *c*, *c*, *c*, formed on the ſides of the glaſs.

And what is very particular with regard to this ſalt is, that, on diſſolving ſome of the cryſtals, reſembling thoſe of glauber ſalt, in pure water, and fully ſaturating the water with the ſalt, in ſome days there formed a number of cryſtals very different in figure and appearance from the former; be-

* The neutral ſalt with vinegar I find mentioned, but not deſcribed, in a chemical dictionary publiſhed at Paris in the year 1766.—All that is ſaid of it is, that it is a ſalt which cryſtalliſes eaſily, but is little known. See the articles ALKALI MINERAL, SEL NEUTRE, and VINAIGRE.

ing ſome of them ſquares, others longiſh parallelograms, others irregular pentagons, and ſome with ſix ſides; ſome were flat, and from $\frac{1}{12}$ to $\frac{1}{5}$, or $\frac{1}{4}$ of an inch thick; others appeared ſomewhat roundiſh, or oval, but the ſides were made up of flat ſurfaces, as are repreſented by the letters *d*, *d*, *d*, &c.

I do not remember to have ſeen ſuch a variety of ſhapes and figures in any other ſalt; and I cannot account for the great difference of appearance in the firſt and ſecond cryſtalliſation in any other way, than from the liquor in the firſt cryſtalliſation having been evaporated to a pellicle, and being very highly impregnated with the ſalt, the cryſtals began to ſhoot at once in every part of it, ſo that they had not room to extend in breadth, and to form themſelves into various ſhapes, as in the ſecond proceſs, where the liquor was not ſo highly concentrated, and where each cryſtal was formed ſeparate, and at a diſtance from another.

2. The plain wine vinegar, treated in the ſame way, but in a narrower veſſel, yielded a ſalt which had a different appearance from the former; for on pouring off the ſuperfluous liquor which remained after the cryſtalliſation was compleated, it ſeemed to be compoſed of a number of ſmall, thin, broad cryſtalline, ſquare plates, ſtanding up from about half an inch to an inch above the ſurface, as repreſented by *a*, *a*, *a*, in fig. 13; on ſeparating them, each cryſtal appeared at the baſis like a ſmall cryſtal of glauber ſalt, which terminated at the top in the thin broad plate already mentioned, as repreſented by the letters *b*, *b*, *b*, &c.

On diſſolving ſome of this ſalt in water, and letting it ſtand for 18 or 20 days, there formed a number

number of crystals of different shapes, as in the distilled vinegar; some such as them, others resembling exactly the figure of the Rochelle salts, but smaller as those at *c x*; some squares, others of different shapes and figures, as at *c*, *c*, *c*, &c. and one large one marked *d*, *d*.

Both the salts from the distilled and from the plain wine vinegar, have a pleasant cool taste, without any disagreeable bitter; and generate cold in the time of their solution in water, for the quicksilver in the thermometer, which stood at 63 in New River water, sunk to 62, as soon as some of this salt, which was put into it, began to dissolve.

From the figure and shape of some of the crystals of the salt of the wine vinegar coming so near to that of the Rochelle salt, I think we may reasonably conclude that the acid of vinegar approaches near to that of tartar, but is not entirely the same.

The salt of the distilled vinegar can be made with great ease and very pure; but the common vinegar contains such a large proportion of oil as to require some care to purify it after it is made.

EXPERIMENT III.

With the crystals of tartar.

The Rochelle salt, made with the acid of tartar, and the fossil alkali, is so common a purging salt, that I shall not enter into any description of it, and I have only given a figure of some of its crystals at fig. 15, that we might be able to compare it with

with the other neutral ſalts made with vegetable acids.

Experiment IV.

With the acid of verjuice of Apples.

I made two trials with the verjuice; the firſt was with a quart of what was old and tart, and took rather above an ounce of the alkali to ſaturate it; the other, which was newer, not ſo tart, and was ſaturated with about ſeven drams of the alkali.

The firſt was evaporated to a few ounces, when an oily or mucous pellicle appeared on the top; after letting it ſtand for ſome days, no ſalt was likely to cryſtalliſe; I therefore diluted it with water, filtered it, clarified it with the white of an egg, and evaporated it a ſecond time; and after it had ſtood for ſome days the ſalt concreted into the form repreſented by fig. 16. It was compoſed of a number of ſmall long cryſtals, which branched out from centres ſomewhat like the ſticks of a fan, or the fibres in the leaf of a tree, ſuch as at *a, a, a.*

The ſecond or new verjuice, after being ſaturated, was allowed to ſtand for four or five weeks, then filtered, purified with the white of an egg, and evaporated; and after ſtanding ſome days in a cool place, a cryſtalliſation was formed, which approached very near in its appearance to the ſalt of apples, though ſomewhat different; it was compoſed of a number of very fine delicate ſmall, flat ſquare or rhomboidal plates ſet upon their edges, near to one another, without any certain regular order

order that I could obſerve, but ſo as on the whole to make a very beautiful appearance; in this cryſtalliſation the ſalt ſeemed to form in clumps, two of which are to be ſeen at *b*, *b*, &c. and a profile view of a ſmall piece at *c*, *c*, and a figure of ſome of the plates laid on their flat ſides at *d*, *d*.

Did the difference of the age of the verjuice employed in theſe two experiments, or the difference of the proceſſes they underwent, make the difference in the appearance of the ſalts obtained in the different cryſtalliſations? The ſalt of the old verjuice approached to that of vinegar; of the new to that of apples.

Experiment V.

With the acid of perry.

At the time I gave in this paper, in the beginning of November, I had made ſeveral attempts to obtain a neutral ſalt from perry (or the fermented juice of pears) but without ſucceſs, owing to the large quantity of ſaccharine juice with which this liquor abounds. But having accidentally left ſome of the concentrated liquor in a ſmall china baſon, on examining it ſome days after the preſent hard froſt had begun, * I found that a cryſtalliſation had taken place.

The cryſtals were flat, long, narrow, very thin tranſparent plates, ſuch as repreſented in fig. 17; they were from a quarter of an inch to near an

* The account of this experiment was given to the Royal Society about the middle of January 1768.

inch

inch long; they were moſtly fixed to the ſides of the baſon by one end, many ſtood almoſt upright, and others lay acroſs each other. One end was commonly made up of two ſhort ſides, which met at a point.

They remained ſome days expoſed to the air in a cold room, and preſerved their tranſparency and figure; but after they had ſtood for about a quarter of an hour in a warm room, while the painter was drawing the figure, they loſt their tranſparency, and became white and mealy. They taſted cool, and ſomewhat bitter in the mouth.

SECTION III.

Of neutral Salts, formed with diſtilled vegetable Acids, and the foſſil Alkali.

Acids diſtilled from wood, and other vegetable ſubſtances, have been mentioned as a diſtinct ſpecies, but no proof has been brought of their differing from the other vegetable acids; on the contrary, in the tables of neutral ſalts given by chemiſts, no notice is taken of any neutral ſalts made with theſe acids; and therefore it is to be preſumed that they imagined them to be nearly of the ſame nature with the others.

In order to know if theſe acids differed from one another, and from the native and other acids, I had ſome guaiac wood, ſome fir wood, and ſome honey diſtilled, and procured ſome of the acid of each, which I ſaturated, filtered, evaporated, and cryſtalliſed.

EXPE-

Experiment I.

With the acid of guaiac wood.

The cryſtals of the neutral ſalt of guaic wood were long and ſmall, and ſhot like the rays of the ſun from a centre, and appeared as repreſented in fig. 18.

Experiment II.

With the acid of fir wood.

The neutral ſalt of fir had a very different appearance; there were no ſuch diſtinct cryſtals as in the other; what were to be obſerved ſeemed to be long and ſmall, to come in many places from points, and to go in ſomewhat of a circular manner, or to deſcribe a curve, and appeared as repreſented by fig. 19.

Experiment III.

With the acid of honey.

It has been a doubt among naturaliſts, whether honey ſhould be ranked among the vegetable or the animal ſubſtances. Moſt chemiſts ſeem to think it ſhould be ranked among the vegetable, and look upon it as made up principally of the juices of plants collected by the bees; but, however that matter may be, the following is an exact account of

 the

the neutral ſalt made with the acid obtained from this ſubſtance by diſtillation.

In order to procure this acid, I prevailed with Mr. Winter, brother-in-law to Mr. Heineken, apothecary, to diſtil four or five pounds of honey in a retort; at firſt he imagined that I only wanted the watry phlegm, which has been called by the name of the ſpirit of honey, and ſtopped the diſtillation before the acid came over; but having diſtilled a ſecond quantity, he procured me about ſix ounces of a very acid liquor, which I mixed with the phlegm or ſpirit which he firſt brought me; I then ſaturated the whole with the foſſil alkali, filtered and evaporated the liquor to a pellicle. After it had ſtood all night in a cool place, I found the pellicle to be compoſed of a yellow, bitter, ſaltiſh, mucous and oily matter; below which was a dark purpliſh liquor, which I poured into a tea cup, and there remained at the bottom of the ſtone gallypot, in which the evaporation had been performed, a yellow concreted matter, ſomewhat of the appearance of yellow wax, mixed with a little honey; on the ſurface of which was to be obſerved a number of globules of the ſame ſort of matter, of the ſize of muſtard ſeeds, and interſperſed with a black very bitter ſtuff. Next day, on examining the dark coloured purpliſh liquor which I had put into the tea cup, I found that a great part of it had concreted into a very beautiful ſalt, which is repreſented by fig. 20. *a, a, a,* ſhews the general form of the cryſtalliſation; *b, b, b, b,* the ſhape, figure, and ſize of ſome of the cryſtals. The cryſtals were almoſt all flat, and ſeemed in general to aſſume the form of long,

long, narrow parallelograms, or longish squares, if I may be allowed to use the expression; *c*, *c*, some of the yellow saline matter.

This salt is pleasant to the taste, and evidently generates cold in the mouth in the time of its solution; but I had not quantity enough to try with a thermometer what degree of cold it generated in the time of its solution in water.

SECTION IV.

Of neutral Salts formed with Flowers of Benzoin, and Salt of Amber.

EXPERIMENTS I. and II.

With the flowers of benzoin.

Most modern chemists have looked upon the gum benzoin as a resinous substance, which bears the same analogy to the vegetable resins, as the succinum or amber does to the fossil bitumens; and they have esteemed the flowers of benzoin to be an acid salt, mixed with an oily and a small proportion of an earthy matter; but have brought no proof of its being so.

1. In order to ascertain this fact, I put two drams and a half of the flowers of benzoin into some water, and then dropped into it by degrees a solution of the fossil alkali; every drop raised an ebullition or effervescence, in the same manner as when any common alkaline salt is thrown into an

acid liquor. I continued adding the alkaline lye till all ebullition ceaſed, and the flowers were fully ſaturated and diſſolved; after which I filtered the liquor, and evaporated it till a pellicle began to appear, and then ſet it in a cool place all night, and next morning I had a fine pure tranſparent neutral ſalt, ſuch as is repreſented by figure 21. It adhered to the china baſon in form of a ſaline cruſt, which I removed; and on looking thorough it in the light, it ſeemed to be compoſed of an infinite number of very ſmall cryſtals; above this lay, in many places, a number of cryſtals of the figure of ſmall oblong parallelograms, as thoſe at *b, b*. But from the greater part of the ſurface of the cruſt there aroſe a number of very fine thin delicate plates of irregular figures, ſtanding on one edge; ſome were ſquares, others parallelograms, and others had more ſides, the general appearance of which was ſuch as is to be ſeen at the letters *a, a, a*, &c.

This ſalt, when firſt made, appeared as tranſparent and clear as glauber ſalt, or nitre; but on being expoſed to the air, became very ſoon white and mealy.

In the time of the evaporation of this ſalt, a ſaline white mealy cruſt roſe every where on the ſides of the china baſon in which the operation was performed, and even came over ſo far, as to cover its whole outſide. What roſe in this manner had a ſweetiſh taſte, and was not ſo ſharp in the mouth as what appeared in a tranſparent ſaline form.

The ſuperfluous liquor, which remained after the cryſtalliſation was compleated, being put into a tea

tea cup, concreted in a very uncommon manner. In the middle of the tea cup it arose something like a plant, or a fountain, where the water is discharged from a number of pipes, and spread from the bottom of this, so as to cover both the inside and outside of the cup, with a sweetish, white, mealy, saline crust, which in many places seemed disposed like the fine fibres of plants, or of the leaves of trees.

2. As a further proof of the flowers of benzoin being an acid of a particular kind, I saturated some of them with the sal volatile ammoniacum, evaporated and crystallised; and obtained an ammoniacal salt, which had a very singular appearance. It was covered on the top with a very white saline pellicle, below which were a number of thin, flat, white transparent crystals, the greater number of which seemed to be exact squares, some few, oblong parallelograms, such as are represented in fig. 22.

The flowers of benzoin generated a considerable degree of cold in the time of their saturation with the volatile alkali; they sunk the quicksilver in the thermometer from 52 to 46.

EXPERIMENTS III. and IV.

With the salt of amber.

The salt of amber is now generally known to be of an acid nature; but from what Monf. Bourdelin has said of it, in the Memoirs of the French Academy of sciences for the year 1742, its acid has been

been looked upon by many chemiſts *, to be exactly of the ſame nature as the ſpirit of ſea ſalt, only mixed with a little of the oleum ſuccini;—though ſome have imagined it to be an acid of the vitriolic kind.

1ſt, When I firſt mixed this acid with the foſſil alkali, I began to believe that what Monſ. Bourdelin had alledged was true; for the liquor taſted ſaltiſh, like to a weak ſolution of ſea ſalt in common water, but I was ſoon convinced of my error; for on evaporating and cryſtalliſing, I had a ſalt very different in its nature and properties from that of ſea ſalt, or of glauber ſalt, one of which ſalts it muſt have been †, had the acid been the marine or the vitriolic. This agrees with what Dr Stockar de Neuforn ‡, has ſaid of this being a particular acid.

* Macquer ſeems to be thoroughly convinced of the acid of ſuccinum, or amber, being the ſame with that of ſea ſalt; for in mentioning the proofs which Monſ. Bourdelin has brought of its being ſo, he ſays, "C'eſt ce point qui eſt l'objet principal de "memoire de Monſ. Bourdelin; & cette decouverte eſt ſans "contredit une des plus belles, & en même temps des plus dif-"ficiles, qu'il y eût à faire ſur ce Bitume." See his Elemens de "Chymie pratique, tom. ii. p. 213.

† Sea ſalt is a neutral ſalt made of the foſſil alkali, and marine acid, or ſpirit of ſea ſalt; and glauber ſalt, of the ſame alkali and the ſpirit of vitriol.

‡ In the year 1760, Dr. Jo. Geo. Stockar de Neuforn, in his inaugural Diſſertation de Succino, publiſhed at Leyden the 7th of July, 1760, proves by a number of experiments, that the acid of ſuccinum is neither that of vitriol nor of ſea ſalt; and he mentions two neutral ſalts made with this acid, the one with the common vegetable alkali, and the other with the volatile.

He ſays that the cryſtals of the one, made with the vegetable alkali, are clear and pellucid, and of the ſame figure as the

The

The cryſtals, I obtained in the firſt experiment I made, were large and flat; and ſuch as are to be ſeen at the letters *a, a,* &c. fig. 23; they were of no certain ſhape or figure; ſome were roundiſh with a number of ſides, others appeared ſomewhat triangular, and others of different figures; and in ſome parts the cryſtalliſation appeared like a piece of rock work. I diſſolved ſome of this ſalt in water, and cryſtalliſed it a ſecond time, but the cryſtals were in general ſmaller than in the firſt operation; and the cryſtalliſation appeared as repreſented by *b, b, b.* In order to ſhew the difference between this and ſea ſalt, I made Mr. Paul draw the figure of ſome beautiful cryſtals of ſea ſalt, near to thoſe of this neutral ſalt of amber.

This ſalt is extremely different in its taſte from that of ſea ſalt, and certainly likewiſe in its virtues and properties.

2. In order to aſcertain more fully that the ſal ſuccini is an acid *ſui generis*, I ſaturated ſome of it with the volatile ammoniac ſalt, cryſtalliſed it, and obtained a neutral ammoniacal ſalt very different from that of the common ſal ammoniacum; it was compoſed of a number of ſmall long narrow flattiſh cryſtals, whoſe ſides were made up of four flat ſurfaces, ſuch as thoſe repreſented in fig. 24, and laid

cryſtals of the ſalt of amber itſelf; that it has a particular taſte, and diſſolves eaſily in water, which the tartarus vitriolatus does not; and when thrown on the fire, or put on a red hot iron, crackles and melts, but yet remains fixed and neuter. Acids make no change on it, nor is aqua fortis converted into an aqua regia by its mixture; it does not precipitate ſilver from ſpirit of nitre, though it precipitates lead from vinegar, in form of a white calx, which, however, cannot be changed into a ſaturnus corneus.

in an irregular order, ſome lying acroſs others, and ſome ſtanding on one end *.

The ſal ſuccini generates a great degree of cold in the time of its ſaturation with the volatile alkali, for it ſunk the quickſilver in the thermometer from 52 to 40; in this it agrees with the common ſal ammoniacum.

The Concluſion.

From the experiments above related, it is evident that phyſicians have hitherto been in a great miſtake, in believing that all vegetable acids were nearly of the ſame nature; for from them it ſhould ſeem that almoſt each of the acids, called vegetable, has ſomething peculiar to itſelf, and upon future trials may be found to have different virtues and properties †.

The different appearance of the neutral ſalts above mentioned, from that of thoſe produced by the union of the foſſil alkali with any of the mineral acids, ſeems to make it doubtful whether the vegetable acids derive their origin from the mine-

* Dr. Stockar de Neuforn ſays, that this ammoniacal ſalt does not precipitate ſilver from aqua fortis, nor change aqua fortis into aqua regia; and when put in a ſilver ſpoon, and ſet over the fire, it melts and flies off in form of a vapour.

† However, it ought to be remarked, that when any of the concentrated ſaturated liquors ſtood for ten or twelve days before they cryſtalliſed, for the moſt part ſome cryſtals of a flat, ſquare, or of a narrow oblong parallelogram figure, were found adhering to the ſides of the cup or baſon in which the liquor ſtood; but whether this was owing to the alkaline baſis of theſe ſalts, or to the acids approaching to each other in their nature, is what can only be determined by future experiments.

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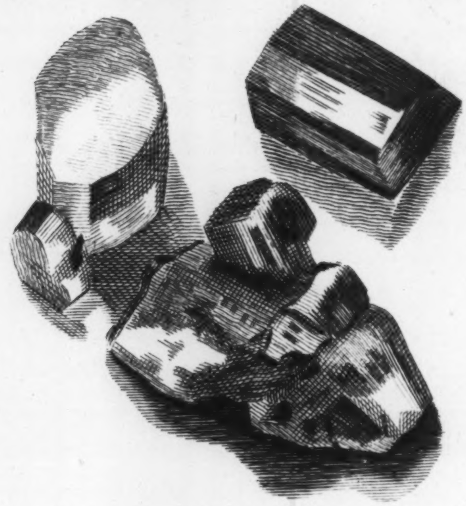
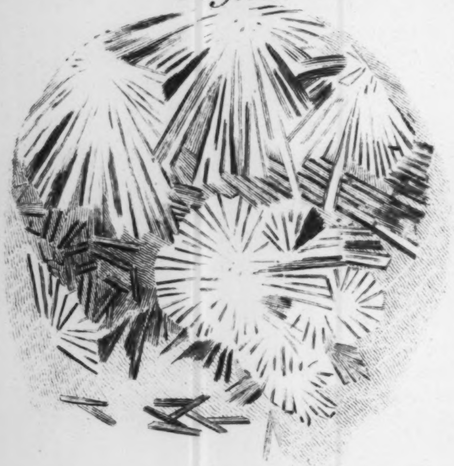
N. Salt of Verjuice.
Fig. 16.

Rochelle Salt.
Fig. 15.



N. Salt of Distill'd
Fig. 14.

N. Salt of Guaiac Wood.
Fig. 18.



N. Salt of Fir.
Fig. 19.

N. Salt o
Fi

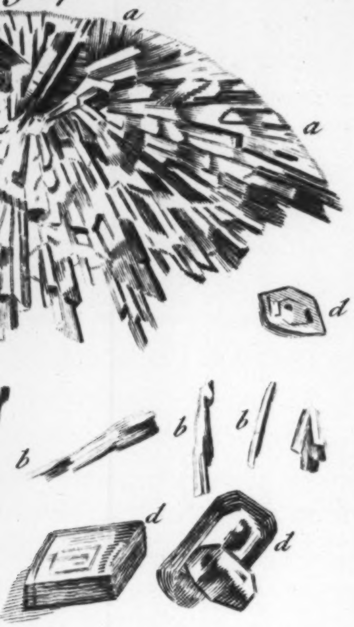
N. Salt of Benzoin.
Fig. 21.

Ammoniacal Salt of Amber.
Fig. 24.

Ammonia

L: Paul delin.

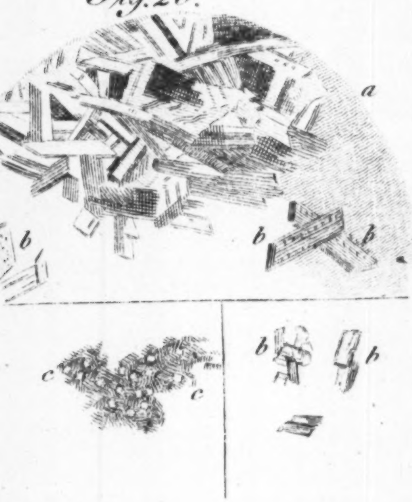
Distill'd Vinegar.
Fig. 14.



N. Salt of Common Wine Vinegar.
Fig. 13.

N. Salt of Perry.
Fig. 17.

N. Salt of Honey.
Fig. 20.



N. Salt of Amber.
Fig. 23.

Ammoniacal Salt of Benzoin.
Fig. 22.

J. Mynde sculp.

ral; or whether they are not new ſubſtances,
cated either in the veſſels of plants by means
the vegetative proceſs, or by fermentation, or
the force of fire. If they owe their origin to
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From what
number of
what has been
is probable that many of the
ſcribed, may prove
cure of diſeaſes.

As there is
as each of them
with each of the

ral; or whether they are not new ſubſtances, generated either in the veſſels of plants by means of the vegetative proceſs, or by fermentation, or by the force of fire. If they owe their origin to the mineral acids, they are certainly ſo much changed in their virtues, and properties by the combination of new particles, and by the proceſſes they have undergone, that they may be looked upon as diſtinct bodies in many reſpects.

From what has been ſaid, it is evident that the number of true neutral ſalts * is infinitely greater than what has been ſuppoſed, of late, by chemiſts; and it is probable that many of the neutral ſalts, above deſcribed, may prove to be excellent remedies in the cure of diſeaſes, as well as uſeful in many manufactories.

As there is ſuch a variety of vegetable acids, and as each of them produces a diſtinct neutral ſalt with each of the three alkalies, I think it would be right to diſtinguiſh them from one another by particular names; the ſalts made with the vegetable alkali may be called *vegetable ſalts*, as both the acid and the alkali are vegetable ſubſtances; thoſe made with the foſſil alkali *neutral ſalts*; and thoſe made with the volatile alkali *ammoniacal ſalts*, as all the neutral ſalts hitherto made with this alkali have gone by this name. Thus we may call the three neutral ſalts made with lemon juice: 1. Vegetable ſalt of lemons. 2. Neutral ſalt of lemons. 3. Ammoniacal ſalt of lemons.

* By true neutral ſalt is meant, a ſalt made with an acid and one of the three alkalies; the word *true* is added to theſe ſalts, to diſtinguiſh them from neutral ſalts, made with earths or metals, and acids.

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By means of theſe neutral ſalts we may be enabled to diſcover many of the properties of vegetable acids, and particularly the different degrees of affinity or attraction between them and alkaline ſalts; thus, for example, if we diſſolve in water ſome of the neutral ſalt of currants, and add ſome lime juice or ſome vinegar, and then evaporate and cryſtallize: if we obtain a neutral ſalt of currants, we conclude that the acid of currants has a greater affinity or attraction to the alkali than the acid of limes or of vinegar; but, if we get a neutral ſalt of limes, or of vinegar, we conclude that theſe acids have a greater affinity with the alkali than the juice of currants.

As I am ſenſible that this account of vegetable neutral ſalts is very incomplete, and that I have done little more than given a very ſuperficial deſcription of their external appearance; and as it will probably require a length of time, and the labours of many, to diſcover fully their virtues and properties, I ſhall recommend it to thoſe who may proſecute this ſubject to endeavour to aſcertain the following facts:

1. What degree of cold or of heat is generated on the mixture of each acid with the different alkaline ſalts; and likewiſe to try the ſame experiment with each neutral ſalt at the time of its ſolution in water.

2. What quantity of pure alkaline ſalt it takes to ſaturate any determined quantity of each of the vegetable acids.

3. What figure each neutral ſalt aſſumes when it is firſt cryſtalliſed, and likewiſe after it has been purified,

purified, and again diſſolved in water and cryſtal-liſed.

4. What quantity of water it takes to diſſolve any determined quantity of each ſalt.

5. What effects theſe ſalts or their ſolutions in water have on oils, ſulphur, ardent ſpirits, metals, earths, and other ſubſtances; what ſubſtances they mix eaſily with, and to what bodies they prove a menſtruum, or aſſiſt in diſſolving.

6. How far they agree in their virtues and properties with the neutral ſalts made with mineral acids, and with each other.

7. What effects they have on the human body; whether they promote more particularly the perſpiration or the ſecretion by the kidneys, or whether they act more readily on the bowels, and promote the diſcharge by ſtool; and to aſcertain the exact and proper doſes of each.

8. And laſtly, what effects fermentation and diſtillation have on native vegetable acids; and to obſerve and compare the appearances of the neutral ſalts made with theſe acids in their different ſtates: viz. 1. In their native ſtate. 2. When made into wine. And 3dly, when made into vinegar; and likewiſe when made with acids brought over by the force of fire, or diſtilled from the ſame juices in each of the three different ſtates mentioned.

And in order to facilitate their labours, I ſhall conclude this long paper with obſerving,

1ſt, That all vegetable juices uſed for making neutral ſalts ought to be ſtrained through a cloth, and then filtered through paper, before they are ſaturated with the alkaline ſalt; and that, after they

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are ſaturated, they ought to be allowed to ſtand for ſome days, and ſome of them for weeks, and then be filtered again, before they are evaporated.

2dly, That it is of uſe to clarify many of theſe juices, after being ſaturated, with the whites of eggs.

3dly, That it is ſometimes eaſier to obtain a neutral ſalt, by evaporating with a boiling heat, than with a ſlow or gentle fire; as the heat of boiling water coagulates, and throws up a quantity of viſcid juices to the ſurface, which cannot be eaſily ſeparated by any other means.

4thly, That the ſweeter any fruit is, and the more it abounds with ſaccharine or viſcid juices, the more difficult it is to obtain a neutral ſalt; and for this reaſon I have not hitherto been able to get any neutral ſalt from the ſaturated juices of pears, or of cherries.

5thly, That, in caſes where we are obliged to employ water mixed with the fruits cut ſmall, inſtead of their juices, it is right to peel off the ſkins before we attempt to ſaturate the acid; otherwiſe the alkaline ſalt is in danger of uniting with, and rendering ſoluble in water, the groſs oils with which the ſkins generally abound, which afterwards prevent the cryſtalliſation of the neutral ſalts.

THE END.